

## **Pest risk assessment made by France on *Hop stunt viroid* (HSVd) considered by France as harmful in the French overseas department of Réunion<sup>1</sup>**

### **Scientific Opinion of the Panel on Plant Health**

**(Question No EFSA-Q-2006-093)**

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#### **SUMMARY**

Following a request from the European Commission, the Panel on Plant Health was asked to deliver a scientific opinion on 30 pest risk assessments made by France on organisms, which are considered by France as harmful in four French overseas departments, i.e. French Guiana, Guadeloupe, Martinique and Réunion. In particular, the Panel was asked whether these organisms can be considered as harmful organisms for the endangered area of the above departments, in the meaning of the definition mentioned in Article 2.1.(e) of Directive 2000/29/EC and thus potentially eligible for addition to the list of harmful organisms in Directive 2000/29/EC.

This document presents the opinion of the Panel on Plant Health on the full<sup>2</sup> pest risk assessment conducted by France on *Hop stunt viroid* (HSVd) with Réunion considered as endangered area.

HSVd is a well-characterised viroid of the family *Pospiviroidae*, which infects citrus, grapevine, apricot, almond, plum, peach and several other species of economic importance belonging to different families. HSVd is considered as widespread in all citrus-growing areas of the world.

The Panel examined in detail the risk assessment provided, and considered the accuracy and quality of the information provided and methods applied for pest risk assessment purposes. The review was based on the principles and terminology of the International Standard on

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<sup>2</sup> The full pest risk assessments have been made according to the Guidelines for the European and Mediterranean Plant Protection Organisation (EPPO) pest risk assessment scheme in EPPO Standard PM 5/3 (1) (EPPO Bulletin 27, 281-305).

Phytosanitary Measures ISPM No. 11<sup>3</sup> [Pest risk analysis for quarantine pests including analysis of environmental risks and living modified organisms (2004)] and the terminology of ISPM No. 5 [Glossary of Phytosanitary Terms (2007)] by the International Plant Protection Convention (FAO, 2007).

The French document concludes that HSVd could feature as a pest in Réunion and notes the possibility that it may already be present in the PRA area<sup>4</sup> in a latent state.

The Panel found that statements in the French document and ratings given in the risk assessment are neither substantiated by references nor supported by verifiable data. HSVd is present in citrus producing countries worldwide, and it can be spread by graft-propagation of infected planting material (budwood). Therefore, the Panel agrees that the introduction of infected propagation material is the most important entry pathway. The volume of imported material into Réunion, however, is acknowledged in the French assessment to be low, due to the small area of citrus under production.

HSVd is a well-characterised viroid in terms of its molecular and biological properties and suitable methods are available to identify and detect it in plant material. As a result the Panel considers that viroid-indexing can reduce the probability of entry via propagation material to a negligible level. However, in the absence of viroid-indexing, the probability of entry would be moderate to high.

The Panel considers the probability of entry to be low in the presence of the existing management measures. However, should these measures be lifted, in the absence of pathogen-testing the probability of entry would be moderate to high.

The Panel concludes that the probability of establishment following the entry of the viroid is high. The probability of spread is, however, considered low, as HSVd is not seed transmitted and has no natural vectors.

The French assessment concludes that the potential for economic impact can be fairly severe but the additional comments do not substantiate this conclusion. The Panel concludes that even though HSVd is a pathogenic agent for certain sensitive citrus cultivars/species grown in Réunion, the information provided is insufficient to suggest that economic consequences would be severe.

Existing risk management measures prevent the importation of citrus planting material from third (non-EU) countries (Annex III A of Directive 2000/29/EC). Virus indexing procedures can be applied as part of existing certification schemes for citrus propagation material in the EU. Furthermore, in the absence of virus indexing, the Panel considers the impact of HSVd to be limited, due to the absence of a natural vector, which limits the potential for further dissemination of the viroid.

Therefore, the Panel concludes that HSVd is not appropriate for evaluation of further risk management measures and thus is not considered by the Panel to be eligible for addition to the list of harmful organisms in Directive 2000/29/EC.

**Key words:** citrus, *Hop stunt viroid*, HSVd, pest risk assessment, Réunion

<sup>3</sup> ISPM International Standard for Phytosanitary Measures. ISPM No. 11: Pest risk analysis for quarantine pests, including analysis of environmental risks and living modified organisms.

<sup>4</sup> PRA area is the area in relation to which a Pest Risk Analysis is conducted [FAO, 2007a]

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## BACKGROUND AS PROVIDED BY THE EUROPEAN COMMISSION<sup>5</sup>

The current Community plant health regime is established by Council Directive 2000/29/EC on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community (OJ L169, 10.7.2000, p. 1), as last amended by Commission Directive 2006/35/EC (OJ L88, 25.3.2006, p. 9).

The Directive lays down, amongst others, the technical phytosanitary provisions to be met by plants and plant products and the control checks to be carried out at the place of origin on plants and plant products destined for the EC or moved within the EC, the list of harmful organisms whose introduction into or spread within the EC is prohibited and the control measures to be carried out at the outer border of the EC on arrival of plants and plant products. A harmful organism is defined in its Article 2.1.(e) as: any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products.

However, the provisions of the Directive are at present not yet applicable to trade in plants and plant products between the French overseas departments and the remainder of the Community. In view of the special nature of the agricultural production of the French overseas departments, additional protective measures justified on grounds of the protection of health and life of plants and plant products therein should be given.

France has therefore prepared for 4 departments (Guadeloupe, Guyana, Martinique and Réunion) 130 pest risk analyses (PRA) on organisms which are considered by France as harmful for the most important crops grown in these departments, such as banana, sugar cane, pine apple, rice, coffee, orchids, Palmae, etc. These PRAs cover a wide range of harmful organisms, such as insects and mites (54), fungi (14), bacteria (20) and virus (42).

In accordance with the discussions on this topic in the meeting of the Standing Committee on Plant Health on 27 and 28 April 2006, it was agreed that in a first phase France would select 30 PRAs among the 130 PRAs initially transmitted. They cover harmful organisms (insects, mites, fungi, bacteria and virus) affecting citrus fruit and bananas grown in the above departments.

Two types of PRA have been made: a full PRA for harmful organisms for which the probability of introduction into the French overseas departments is high with economic important crops and a simplified PRA for organisms for which the probability of introduction is extremely low.

The full PRAs have been made according to the Guidelines for the European and Mediterranean Plant Protection Organisation (EPPO) pest risk assessment scheme in EPPO Standard PM 5/3 (1) (EPPO Bulletin 27, 281-305). This scheme aims at assessing the potential risk of a particular pest (or harmful organism) for a clearly defined area through a quantitative evaluation of that risk based on questions to which replies are given on a 1-9 scale. Expert judgement is used in interpreting the replies. Moreover for each of the 130 harmful organisms a data sheet containing the most important data on the organism has been made according to the EPPO Standard PM 5/1 (1) on Checklist of information required for PRA (EPPO Bulletin 23, 191-198). The guidelines are based on many years experience of EPPO experts in the EPPO Panel on PRA and the EPPO Panel on phytosanitary measures. They conform with the International Standards on Phytosanitary Measures ISPM No. 11 (Guidelines on PRA for quarantine pests) and use the terms of ISPM No 5 (Glossary of phytosanitary terms).

The simplified PRAs contain in a “synthetic fiche” the information available allowing the assessment of the risk associated with the relevant organism.

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<sup>5</sup> Submitted by the European Commission, ref. SANCO E/1/VE/svi D(2006)510488

**TERMS OF REFERENCE AS PROVIDED BY THE EUROPEAN COMMISSION**

EFSA is requested, pursuant to Article 29(1) and Article 22(5) of Regulation (EC) No 178/2002, to provide a scientific opinion on 30 PRAs made by France on organisms which are considered by France as harmful in 4 French overseas departments, i.e. Guadeloupe, French Guiana, Martinique and Réunion, and in particular whether these organisms can be considered as harmful organisms for the endangered area of the above departments in the meaning of the definition mentioned in Article 2.1.(e) of Directive 2000/29/EC and thus potentially eligible for addition to the list of harmful organisms in Directive 2000/29/EC.

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## ASSESSMENT

### 1. Introduction

This document presents the opinion of the Panel on Plant Health on the pest risk assessment conducted by France on *Hop stunt viroid* (HSVd) with Réunion considered as endangered area.

#### 1.1. General introduction to *Hop stunt viroid*

The cachexia disease was described in California in 1950, as a syndrome including discoloration, gumming and browning of phloem tissues, wood pitting and bark cracking on Orlando tangelo (*C. paradisi* × *C. reticulata*) (Childs, 1950). Other citrus species sensitive to this disease are alemow (*Citrus macrophylla*) and Rangpur lime which are used as rootstocks, and mandarins, mandarin hybrids (tangors and tangelos), clementines, satsumas and kumquats used for fruit production.

*Hop stunt viroid* (HSVd) is a well-known pathogen described in 1977 (Sasaki and Shikata, 1977) as the causal agent of the hop stunt disease in Japan. The cachexia disease of citrus has been suspected to be caused by a viroid in 1983 (Roistacher, 1983) and the viroid agent was later identified and characterised as a strain of *Hop stunt viroid* (HSVd) (Levy and Hadidi, 1993; Reanwarakorn and Semancik, 1998; Semancik *et al.*, 1988). It was subsequently demonstrated that cachexia and a similar disorder described earlier as xyloporosis in Palestine sweet lime (*C. limettioides*) are induced by the same type of HSVd variants (Reanwarakorn and Semancik, 1999). HSVd is present worldwide in citrus growing areas (Hadidi *et al.*, 2003). HSVd also infects tolerant citrus species without inducing any symptoms, and therefore the presence of the pathogen may be overlooked.

#### 1.2. The document under scrutiny

The assessment of risks of the organism is presented by the French risk assessors in a so-called “full” pest risk assessment made according to the Guidelines for the European and Mediterranean Plant Protection Organisation (EPPO) pest risk assessment scheme [EPPO Standard PM 5/3 (1) of the EPPO Bulletin 27, 281-305].

Based on this document France requested *Hop stunt viroid* be added to the list of harmful organisms in Directive 2000/29/EC. However, based on the French document, it is not clear whether or not there is a request to include HSVd to the list of harmful organisms.

#### 1.3. Evaluation procedure

The Panel examined in detail the documents provided, and considered the accuracy and quality of the information and methods applied for pest risk assessment purposes.

The evaluation of the French document was conducted on the basis of an English translation from the original submission in French, which remains the reference language.

Detailed comments have been made only for the questions where it was considered that the French assessment is incorrect or could be improved. Where the Panel has uncovered new information that supports the French pest risk assessment, this has been noted. While the literature has been checked and additional data has been sought, no new analysis has been undertaken. The Panel has noted where it considers the risk scores provided by France were too low or too high but has not suggested an exact score.

#### 1.4. General comments on the document

The document comprises 23 pages and is divided into two parts:

- Part I provides background information required for the assessment
- Part II contains the assessment of the risks of the organism in subject.

The French document contains only the pest risk assessment part of the analysis (despite the fact that "Pest risk analysis" is mentioned in the title of the French document) as France decided to separate the risk assessment from the risk management.

The document includes 22 references. Some statements made in the document are neither substantiated by references nor supported by verifiable data.

The document was compiled in 2003 and therefore new information was reviewed and updated by the Panel where relevant to the risk assessment.

The Panel reviewed a translation of the original French document. Some errors were noted in relation to specific risk assessment terminology. For example, the terms probability and risk are incorrectly used as synonyms in the translated text, and so are the terms "average" and "moderate" when describing specific ratings in Part 2 of the risk assessment. In cases of doubt, the Panel has referred to the original French text.

The translation of "plant" as "seedling" in the English translation also causes confusion in the assessment of entry pathways.

#### 1.5. Methodology applied for the risk assessment

The Panel considered the methodology used in the risk assessment provided in Part 2 of the document and concluded that:

- The document does not take into account the new situation that would be created in the pest risk assessment area should the current regulations be modified or eliminated.
- Probabilities of entry and establishment, introduction, impacts and an overall risk rating are expressed in qualitative terms such as "low" "moderate" "high" etc. A quantitative scale (1-9) is also used. Numeric and descriptive ratings used in the document are not explained, and thus do not allow for accurate interpretation.
- In some cases, the rating given in the pest risk assessment are not justified or substantiated by the information provided in Part 1 of the document.
- The method of combining risk ratings and ascribing an overall risk rating is not defined and assumes equal weighting to the questions.

## 2. Evaluation of the pest risk assessment

### 2.1. Pest categorization

#### 2.1.1. Identity of pest

The French document clearly identifies the pest as *Hop stunt viroid* (HSVd). Since then, the International Committee on the Taxonomy of Viruses has omitted the subfamily taxon for viroids. Therefore, the taxonomic position of HSVd is: Family *Pospiviroidae*, genus *Hostuviroid* (Flores *et al.*, 2005). This viroid is a single stranded covalently closed RNA molecule of 295-303 nucleotides which, like other members of the family *Pospiviroidae*,

contains a Central Conserved Region (CCR) and a Terminal Conserved Hairpin (TCH) located in the left terminal domain, which are presently used for taxonomical classification of viroids.

Even though HSVd is the only member of the genus *Hostuviroid*, it presents similarities to other members of the family *Pospiviroidae*, like the *Potato spindle tuber viroid* (PSTVd) and *Chrysanthemum stunt viroid* (CSVd), which belong to a different genus and are both included in Directive 2000/29/EC.

As indicated in the document, graft-transmission to Etrog citron (*C. medica* L.) provides a biological amplification system that, coupled with sequential polyacrylamide gel electrophoresis (sPAGE), allows the separation and isolation of HSVd and other viroids (Duran-Vila *et al.*, 1991; 1993). Although the French document lists several other viroids in citrus that may interfere with the identification of HSVd (Duran-Vila and Semancik, 2003), molecular methods i.e. molecular hybridization using HSVd specific probes (Palacio *et al.*, 2000) and RT-PCR based methods using HSVd specific primers (Ito *et al.*, 2002; Nakajara *et al.*, 1999; Yang *et al.*, 1992) are also available. Recent improvements of RT-PCR technology (Bernad and Duran-Vila, 2006; Ragozzino *et al.*, 2004; Tessitori *et al.*, 2005) allow the unequivocal identification of HSVd.

HSVd is very widespread but the Panel considers that since only pathogenic variants cause symptoms, identification of HSVd pathogenic strains is essential to identify the true cachexia agent. In the past, identification of cachexia strains of HSVd relied only on biological indexing on the Parson's madarin indicator (Roistacher *et al.*, 1973). Presently the identification can accurately be achieved by RT-PCR using cachexia specific primers (Bernad and Duran-Vila, 2006; Reanwarakorn and Semancik, 1999) and/or amplicon sequencing.

The Panel concludes that HSVd is a well characterized pathogen for which reliable detection techniques are available. However, the Panel notes that the use of at least two methods, based on different strategies, is recommended for reliable identification of HSVd.

### 2.1.2. Presence or absence in PRA area

Although the French document imprecisely indicates in Part 1 of the document that the cachexia viroid (ie pathogenic variants of HSVd) can exist in the PRA area, later in the assessment (Part 2) it indicates that HSVd is not present in the PRA area. Finally, the conclusion of the risk assessment indicates that HSVd may already be present in a latent state. The Panel therefore concludes that there is uncertainty on the status of HSVd in Réunion. It notices, however, that HSVd is commonly found in all citrus growing areas of the world, especially in old orchards that were established before pathogen-tested plant materials became available.

### 2.1.3. Regulatory status

French Legislation.

In the decree of 1990, supplemented by that of 3 December 1991 (JORF 16/02/1992, Annex IIB), HSVd identified as "citrus cachexia" is listed among organisms that may not be introduced into Réunion. Permanent mandatory control was prescribed for this viroid in the decree of 31 July 2000 (JORF 31/08/2000)

EU Legislation

HSVd is not currently listed as a quarantine pathogen in the EU but the Panel notes that HSVd is listed in Council Directive 93/48/EC as one of the diseases that must be absent from certified plant materials.

#### **2.1.4. Potential for establishment and spread in PRA area**

Réunion is a volcanic island in the South-East Indian Ocean (55°30 East longitude, 21°05 South latitude) about 700 km from Madagascar. The climate is tropical, with temperatures affected by elevation. The average coastal temperature is between 18-31°C, with temperatures dropping in the interior. Humidity is high.

Réunion has eco-climatic conditions favourable for the establishment of the host plants and therefore also for the establishment and survival of HSVd. The Panel confirms that no HSVd vectors have been identified and that HSVd is not seed-transmitted. The main means of spread is therefore by the propagation of infected budwood and, to a lesser extent, by mechanical transmission through contamination of pruning and cutting tools (Barbosa *et al.*, 2005; Garnsey and Whidden, 1973).

#### **2.1.5. Potential for economic consequences in PRA area**

The citrus growing area of Réunion is reported to be 301 ha, mainly in the East and Southeast regions of the island, with an annual production of about 8000 tons used for local consumption (Agreste, 2007). The French document states that citrus are a diversification crop in Réunion. The Panel established that the major cultivars grown in Réunion are Ortanique tangor (*C. reticulata* × *C. sinensis*), Common clementine (*Citrus clementina*) and Beauty and Dancy mandarins (*Citrus reticulata*) (Vernière, personal communication) which are sensitive to the cachexia strains of HSVd. Symptoms on these cultivars may range from unappreciable in mild Mediterranean climates to quite severe in hot areas, but very limited information is available regarding the economic consequences. Symptoms can be enhanced in trees grown on certain susceptible rootstocks such as alemow (*Citrus macrophylla*) or Rangpur lime (*Citrus limonia*), which however are presently not relevant in Réunion but may become more important in the future. Unfortunately no information is available regarding losses caused by HSVd under the specific agronomic and environmental conditions of the PRA area.

#### **2.1.6. Conclusion of pest categorization**

HSVd can be clearly identified. The presence of susceptible hosts in the PRA area indicates a potential for economic consequences. Although current French regulations prevent the introduction of infected citrus propagation material into Réunion, there is some uncertainty as to whether HSVd could already be present on tolerant varieties in old plantings established before pathogen testing schemes became available. Therefore, in the absence of verifiable evidence of the presence of the pathogen, the extent of the occurrence of HSVd in the PRA area is uncertain.

### **2.2. Assessment of the probability of introduction and spread**

#### **2.2.1. Probability of entry of the pest**

##### **2.2.1.1. Identification of pathways**

The French document identifies two pathways; the commercial import of citrus propagation materials and the introduction by private individuals. The Panel agrees with the French document that the commercial introduction of infected plants and budwood for propagation is the most important pathway.

Although HSVd may be present in non-citrus hosts, no natural vectors are known to be involved in the transmission and dispersal of HSVd. Therefore the probability of transfer of

HSVd from the alternative hosts to citrus or, conversely, of citrus to alternative hosts is considered by the Panel to be very remote.

#### 2.2.1.2. Probability of the pest being associated with the pathway at origin

The French document suggests that HSVd is fairly unlikely to be associated with the pathway at origin. However, this is assessment probably reflect the fact that the document considers only the importation of pathogen-tested material as required by the current French regulations. In the absence of the current regulations and pathogen-testing procedures, the Panel considers the probability of HSVd being associated with the pathways at origin could be high, given the wide distribution of HSVd in many parts of the world.

#### 2.2.1.3. Probability of survival during transport or storage

The Panel agrees with the statement of the French document that HSVd is very likely to survive in plant propagation materials (budwood) during transport and storage.

#### 2.2.1.4. Probability of pest surviving existing pest management procedures

The French assessment is unclear in its presentation and ratings relating to existing pest management information. This relates particularly to consideration of the propagation material pathway, both with and without the presence of management measures (pathogen-testing and/or certification). No information is provided to describe the pest management measures currently taken against citrus pathogens in Réunion.

The Panel concludes that pathogen-testing as part of certification procedures currently available for citrus viroids have the potential to reduce the probably of entry through the commercial import pathway to a negligible level.

#### 2.2.1.5. Probability of transfer to a suitable host

The French document states that the probability of transfer of HSVd to a suitable host is very likely. The Panel confirms that HSVd can be transferred to a suitable host by graft-propagation of infected budwood. HSVd can also be mechanically transmitted by cutting and pruning tools but the efficiency is low (Barbosa *et al.*, 2005).

The probability of natural transfer is negligible, as no natural vectors are known and as HSVd is not seed-transmissible.

#### 2.2.1.6. Conclusion on the probability of entry

The French document concludes that there is a moderate probability of entry but the semi-quantitative assessment methodology used and the unclear procedure for the combination of ratings do not adequately explain how that conclusion is derived. The document also includes a qualifying comment stating that the rating was reduced due to the small volume likely to be imported. The small volume of material imported is not discussed in detail earlier in the assessment and the level of reduction in the rating ascribed to this factor is not stated.

The Panel generally agrees with the probability rating of moderate given in the French document but considers that in the absence of the existing management measures (importation of pathogen-tested plant material) the probability of entry would moderate to high.

## 2.2.2. Probability of establishment

### 2.2.2.1. Availability of suitable hosts, alternate hosts and vectors in the PRA area

As reported in the French document *Rutaceae* and non *Rutaceae* hosts of HSVd are present in the PRA area. Besides citrus, hosts also include grapevines, stone and pome fruit trees and cucumber.

The main citrus grown in the PRA area are mandarins and mandarin hybrids (Ortanique tangor, Common clementine and Beauty and Dancy mandarins), accounting for about 50% of the area grown. Tahiti lime (*Citrus latifolia*), Mexican lime (*Citrus aurantifolia*) and lemons (*Citrus limon*) account altogether for about 34%, and sweet orange (mainly Washington navel) for 16% of the area grown (FAOSTAT, 2008). In addition, combava (*Citrus histryx*), lime and lemon trees are commonly grown in small holdings and backyards essentially for home consumption. The citrus relative *Murraya paniculata* is widely used as an ornamental plant as well as in hedges. The major citrus rootstock is Carrizo citrange (*Poncirus trifoliata* × *Citrus sinensis*) which accounts for 95% of the new plantings (Vernière, personal communication).

No natural vectors are known to be involved in HSVd transmission.

### 2.2.2.2. Suitability of environment

The Panel agrees with the French document that HSVd replicates and spreads in all areas where eco-climatic conditions are favourable for the establishment of its host plant. High temperatures favour viroid replication and therefore increase its titre within plant tissues.

Once a plant has become infected with HSVd, it will remain infected. The Panel agrees with the statement of the French document that like other viroids (Garnsey and Whidden, 1973; Roistacher *et al.*, 1969), HSVd survives in infected plant materials even at low temperatures and persists in dried plant tissues and on contaminated tools (Murcia and Duran-Vila, unpublished results). However, while this might theoretically and experimentally be feasible, it is very unlikely that in nature, this will represent a source of inoculum (Barbosa *et al.*, 2005).

### 2.2.2.3. Cultural practices and control measures

The Panel agrees that control of HSVd is most effectively achieved through preventative measures and, in particular, by the implementation of pathogen-testing programs to ensure the HSVd-free status of the propagation material.

In countries that have developed sanitation and certification programs (USA, Australia, Spain, France, Italy) old HSVd infected plants have been gradually substituted by HSVd-free material, and therefore the inoculum sources have decreased.

The Panel agrees that the use of tolerant cultivars grafted on tolerant rootstocks can also provide a means of disease control. However, it should be taken into consideration that infected symptomless plants constitute reservoirs from which the pathogen may potentially be mechanically transmitted to sensitive rootstock/scion combinations.

### 2.2.2.4. Other characteristics of the pest affecting the probability of establishment

The Panel agrees as stated in the French document, that HSVd may exist in infected tolerant hosts without displaying symptoms.

### 2.2.3. Probability of spread after establishment

The Panel confirms the statement of the French document that the probability of spread can be considered as low due to the fact that no natural vectors are known and that HSVd is not seed-transmitted. Therefore, the Panel considers that the main means of spread is by vegetative propagation of infected material.

Although HSVd can be mechanically transmitted, its spread by contaminated tools has been shown to be less efficient than initially thought (Barbosa *et al.*, 2005). In addition the low efficiency of this process can be further reduced by disinfection of cutting and pruning tools.

### 2.2.4. Conclusion on probability of introduction and spread

The Panel generally agrees the French document's rating of the probability of entry as moderate but further considers that in the absence of the existing management measures the probability of entry would be medium to high.

The Panel considers the probability of entry to be high because HSVd will be established following the planting of any infected material.

The Panel concludes that the probability of natural spread is low because HSVd is not vector- or seed-transmitted, although the viroid can be further spread from infected plants used as a source of propagation material and it can also be spread, with low efficiency, by contaminated pruning tools.

## 2.3. Assessment of potential economic consequences

### 2.3.1. Direct pest effects

#### 2.3.1.1. Crop quality and/or yield losses

In addition to the characteristic discoloration, gumming and browning of phloem tissues, wood pitting and bark cracking, severely affected trees may show general decline and low fruit production. The Panel considers that symptoms may range from virtually imperceptible to severe and that such differences depend on the sensitivity of the host and on the environmental conditions of the growing area. The Panel agrees with the French document, which indicates that the economic damage results from the fact that declining trees are less productive but that specific assays which evaluate yield losses are scarce. The data available on infected clementine trees show yield losses of 10-30% (Vernière *et al.*, 2004) but no information is available regarding the effect HSVd under the specific agronomic and environmental conditions of the PRA area.

The Panel considers that among the citrus cultivars grown in Réunion, only the mandarin and mandarin hybrids, which account for about 50% of the citrus industry, are sensitive to HSVd, whereas the Carrizo citrange, which is the major rootstock and accounts for 95% of the new plantings is tolerant. Overall, the Panel finds that mandarin and mandarin hybrids will yield a reduced crop if infected, but there is insufficient information to support the overall conclusion of the French document, which rates the direct effects as fairly serious. In addition, the Panel stresses that this qualification applies only to the sensitive species grown in Réunion and not to tolerant ones.

#### 2.3.1.2. Control measures, efficacy and costs

The Panel agrees that control of HSVd is most effectively achieved through preventative measures and, in particular, by the implementation of existing viroid-indexing procedures as part of certification programs to ensure the HSVd-free status of the citrus propagation material.

In countries that have developed sanitation and certification programs (USA, Australia, Spain, France, Italy), old HSVd-infected plants have been gradually substituted by HSVd-free material, and therefore the inoculum sources can be decreased over time.

The efficacy of these measures depends on the proper implementation of suitable detection tests or on the appropriate selection of the sources from which propagated materials are obtained.

The Panel also agrees that the use of tolerant cultivars grafted on tolerant rootstocks provides a means of disease control.

### **2.3.2. Indirect pest effects**

#### 2.3.2.1. Export markets

Citrus is produced only for local consumption in the PRA area, and therefore HSVd would have no effect on export markets

#### 2.3.2.2. Non-commercial and environmental consequences

No environmental consequences have ever been described as a result of HSVd infection. The Panel agrees with the French document, which states that non-commercial and environmental consequences of HSVd in the PRA area would be of low importance.

### **2.3.3. Conclusion of the assessment of economic consequences**

The French document concludes that the economic impact seems to be fairly limited but that in the absence of precautions the viroid could damage a citrus industry that receives little economic support.

The Panel considers that the impact of HSVd would be low and agrees with the low rating given by the French document. In addition, given the absence of efficient natural transmission mechanisms and the limited potential for spread to other citrus plants in the PRA area, the Panel considers the potential economic consequences to be very limited.

### **2.4. Comments on the conclusion of the pest risk assessment**

The comments given in the final evaluation are often contradictory to information and ratings given earlier in the assessment. The final conclusions reached by the French document are contradictory and not well supported. Preventative measures such as the use of propagation material from a citrus certification are acknowledged as an effective means to reduce the probability of introduction to a negligible level. It is also acknowledged that HSVd may already be present in a latent state in the PRA area. The final conclusion of the assessment is unclear, suggesting that it is essential to remain vigilant with regard to imports of plant material.

#### 2.4.1. Degree of uncertainty

The French document did not discuss uncertainties. Due to the fact that HSVd is a well-characterized pathogen, the degree of uncertainty with respect to the pathogen is low. However, the Panel concluded that there is uncertainty relating to the potential presence of HSVd in the PRA area and to its potential economic impact.

### CONCLUSIONS AND RECOMMENDATIONS

The French document concludes that HSVd could feature as a pest in Réunion and notes the possibility that it may already be present in the PRA area in a latent state.

The Panel found that statements in the French document and ratings given in the risk assessment are neither substantiated by references nor supported by verifiable data. HSVd is present in citrus producing countries worldwide, and it can be spread by graft-propagation of infected planting material (budwood). Therefore, the Panel agrees that the introduction of infected propagation material is the most important entry pathway. The volume of imported material into Réunion, however, is acknowledged in the French assessment to be low, due to the small area of citrus under production.

HSVd is a well-characterised viroid in terms of its molecular and biological properties and suitable methods are available to identify and detect it in plant material. As a result the Panel considers that viroid-indexing can reduce the probability of entry via propagation material to a negligible level. However, in the absence of viroid-indexing, the probability of entry would be moderate to high.

The Panel considers the probability of entry to be low in the presence of the existing management measures. However, should these measures be lifted, in the absence of pathogen-testing the probability of entry would be moderate to high.

The Panel concludes that the probability of establishment following the entry of the viroid is high. The probability of spread is, however, considered low, as HSVd is not seed transmitted and has no natural vectors.

The French assessment concludes that the potential for economic impact can be fairly severe but the additional comments do not substantiate this conclusion. The Panel concludes that even though HSVd is a pathogenic agent for certain sensitive citrus cultivars/species grown in Réunion, the information provided is insufficient to suggest that economic consequences would be severe.

Existing risk management measures prevent the importation of citrus planting material from third (non-EU) countries (Annex III A of Directive 2000/29/EC). Virus indexing procedures can be applied as part of existing certification schemes for citrus propagation material in the EU. Furthermore, in the absence of virus indexing, the Panel considers the impact of HSVd to be limited, due to the absence of a natural vector, which limits the potential for further dissemination of the viroid.

Therefore, the Panel concludes that HSVd is not appropriate for evaluation of further risk management measures and thus is not considered by the Panel to be eligible for addition to the list of harmful organisms in Directive 2000/29/EC.

## DOCUMENTATION PROVIDED TO EFSA

1. Letter, dated 14 July 2006 with ref. SANCO E/1/VE/svi D(2006) 510488 from P. Testori Coggi to C. Geslain-Lanéelle.
2. Analyse du Risque Phytosanitaire AGR-v1 : *Hop stunt viroid* (HSVd-c). Rédaction : C. Vernière / CIRAD – Septembre 2003.

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